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ABSTRACT

In order to investigate the use of Computer Assisted Instruction (CAI) as a means of implementing an alternative method of learning for Bristol Community College students, a nationwide survey of 31 educational institutions was undertaken in 1973 (66 percent response rate). On the basis of survey responses, this document describes the CAI systems of eight selected institutions which are using CAI and are leaders in the CAI field. In addition, the CAI facilities of three southern Massachusetts institutions which either have CAI or are planning to implement CAI are described on the basis of information gleaned from site visits. Several alternative budgets for CAI implementation at Bristol are presented, calculated according to time sharing hardware with three alternative institutions, and on the basis of six alternative software systems. Sample CAI programs are presented, illustrating four possible uses of CAI: drill and practice, tutorial, simulation, and problem solving. Recommendations for implementation are made and a bibliography on CAI is appended.
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COMPUTER ASSISTED INSTRUCTION - AN ALTERNATIVE
APPROACH TO LEARNING FOR BRISTOL COMMUNITY
COLLEGE STUDENTS

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BRISTOL COMMUNITY COLLEGE

A PRACTICUM PRESENTED TO NOVA UNIVERSITY IN PARTIAL
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ABSTRACT

Bristol Community College has historically used the traditional methods of teaching/learning. Research into the backgrounds of Bristol Community College's diverse student population has uncovered a dire need for an alternative approach to learning. The authors of this report propose that a solution to meet this need is in the field of Computer Assisted Instruction.

The authors have investigated and researched thoroughly CAI systems from a hardware and software viewpoint and the procedures for implementation at Bristol Community College. Area institutions connected with Computer Assisted Instruction were visited and consulted concerning the possibility of Bristol Community College sharing its computer time.

The authors propose that Computer Assisted Instruction is an alternative method of learning for Bristol Community College students and that the College should implement this system by the Fall Semester, 1974. Further recommendations are that the College should enter into a time-sharing contract rather than a entire unbudgeted purchase.

PREFACE

Bristol Community College has students of diverse background, age and educational level. The diversity of this population involves a high percentage of immigrants, disadvantaged adults, veterans and housewives. The purpose of the following study was to investigate how the College can better serve it's diverse population with an alternative to the traditional mode of learning. As a result of this study, it is hoped that the faculty of Bristol Community College will be encouraged to develop new teaching methods and sound learning theories.

We would sincerely like to thank all the individuals and institutions who provided us with helpful information. We would especially like to thank Massasoit Community College, Southeastern Massachusetts University and Wheaton College for the hospitality extended to us in our visitations.

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CHAPTER 1

THE PROBLEM

Educational attainment is an important characteristic of any community or region. It is used as a barometer by business and industry to gauge the "trainability" of a potential labor force. It is in the area of educational attainment that the Fall River region is found wanting. In comparison, the city falls short of figures cited for the State and the Nation. In 1970, the median school years completed by people 25 years and older in Fall River was 8.8; the state figure was 12.2 and the national figure was approximately 12.0.

Another indicator of educational attainment is the percentage of people who have completed High School. The 1970 census shows that 58.8% of people 25 years of age and over in the state of Massachusetts have completed High School, 31.8% in Fall River Metropolitan area and 25.6% in the city of Fall River. These are staggering statistics.

In a recent community workshop on youth, education and the drop-out rate in Fall River were issues of particular concern to the participants. Students find their educational experience in terms of curriculum content and variety to be unstimulating and unchallenging. Their attitude is reflected in the extremely high drop-out rate for 1969-70: 8.9% in grade 9, 10.9% in grade 10, 7.9% in grade 11, and 6.5% in grade 12. With a total of 469 students officially dropping

out of school that year, it means that 30% of those who begin ninth grade in Fall River never complete high school.¹

The educational attainment level for the Portuguese community is even lower than that of the city. A survey was done by Walter Frazee, Jr. of Bristol Community College on Adult Education Needs in the Model Neighborhood Area.² The MNA is the area with the highest concentration of Portuguese in Fall River. Frazee found that 83% of the Portuguese immigrants interviewed had received less than an eighth grade education.

The ability to speak English is another indication of educational attainment. Frazee pointed out that respondents who spoke little or no English had significantly less schooling than those whose English was either fairly good or very good. In the same way, households where English is generally not spoken reflect the lowest educational levels.

Mixed language households showed great improvement but were still far below the median grade attainment level of English-speaking families.³ A recent survey (March 1972) of all MNA residents found that of 3,292 Portuguese persons interviewed, over one-third (1,185) spoke only Portuguese.

1. Project Process, ESEA Title VIII, "Final Evaluation Report" (unpublished report, Fall River, Massachusetts, 1971).

2. Walter Frazee, Jr., "A Survey of Adult Education Needs in the Model Neighborhood Area of Fall River, Massachusetts" (unpublished report, Bristol Community College, 1971).

3. Ibid, p.16.

The Fall River area is also described as an economically depressed area. (See appendix A, for maps describing economics, population unemployment rate, and degree granting institutions distributions in the State of Massachusetts).

Bristol Community College has made attempts to deal with the problems mentioned above. For the most part the approach has been traditional. - ie: Lecture, Lab and Recitation. At the onset, perhaps this was all that could be done given limited resources and manpower.

The college offers a Liberal Arts Program and a wide variety of career choices in an effort to meet community needs (see appendix A for report from registrar to President).

Additionally the statistics reported on students enrolled in these programs indicate the diversity of backgrounds involved.

TABLE I

FALL SEMESTER 1973-BACKGROUND OF FULL TIME DAY STUDENTS

FULL TIME		BLACK	ORIENTAL	SPANISH SUR-NAMED	PORTU- GUESE	ALL OTHERS	TOTAL
Freshmen	M	31	2	7	191	229	460
	F	33	3	3	177	233	449
Sophomore	M	16	1	2	183	174	376
	F	19	1	2	155	149	326
PART-TIME							
Freshmen	M	3	0	0	8	9	20
	F	4	0	1	9	13	27
Sophomore	M	-	-	-	2	12	14
	F	-	-	-	1	15	16
TOTALS		106	7	15	726	834	1688

As the college has grown the institutional mission has come under review by various groups. Some of the questions that have come into focus have been articulated by Dr. Basil Castaldi of Bristol Community College in his report on the Educational Opportunities Institute:⁴

1. What is Bristol Community College doing for the person who wishes just a little bit more training in order to advance in his present job? A few situations are presented to clarify the problem.
 - a. How can an adult office clerk become an executive secretary requiring improvement in communication, human relations, and technical terminology?
 - b. How can a storekeeper become an inventory control supervisor using today's college orientated adult education approach?
 - c. How can a hospital orderly become a medical laboratory technician?
 - d. How can an automobile lubricator become an automobile service manager?
2. What is Bristol Community College doing for the adult who is unhappy in his present job, or whose job is now obsolete?
 - a. How can a person possessing manual skills be re-trained for one at a higher level requiring a greater knowledge of basic physics, chemistry and mathematics?

4. Basil Castaldi, "The Educational Opportunities Institute" (unpublished report, Bristol Community College, 1970.) p.2

- b. How can an adult be prepared for another job at his own rate while he is still earning a living at his present job?
 - c. How can an adult achieve his occupational goals without being enrolled in conventional classes that force him into a "lock-step" mold with other adults who may have different goals?
3. What is Bristol Community College doing for the adult who is capable of receiving a Ph. D. but has completed only a sixth grade education?
- a. How can the intellectual and manual skills of adults be developed at an individual rate and at a level commensurate with the abilities and aspirations of the adult?

These questions reflect some of the deep concern in trying to meet the educational needs of the type of students at Bristol Community College.

There is also another most important function of the College, that of Continuing Education and Community Services.

It is noted in Volume I of a Summary Report and Recommendations by the University Consultants Incorporated for the Massachusetts Advisory Council on Education that: The Commonwealth should recognize that it has a valuable educational resource in the existing system of continuing and part-time post-secondary education; that this particular system's characteristics as an educational model are significantly different from the traditional full-time day higher education system

and more suited to the varied needs of an adult clientele; and that therefore the autonomy and independence of continuing and part-time education should be strengthened, according it equal status to full-time higher education, so that it may maintain its non-traditional operational characteristics and truly become an alternative post-secondary education system for adults.

This is indicative of what the state priorities are. At Bristol Community College we would echo by saying "right on". The report additionally goes on to say that the New Non-Traditional Study Movement in Continuing Education has seen the emergence of many new efforts focused on non-traditional learning formats in Massachusetts. Non-traditional study, once represented by innovative efforts in continuing education programs, has suddenly become a focus of reform in traditional college programs. Until as recently as one year ago, Massachusetts had lagged behind other large states in planning and implementing State-wide systems of non-traditional studies and in encouraging and supporting the creation of individual pioneering, precedent-setting single programs.

One of the major recommendations of the report is that: Access to system of continuing and part-time post-secondary education in Massachusetts should be assured for all elements of the population through a variety of measures such as the increased use of educational technology, variety of times offered, better transportation services, counseling and outreach services, publicity, vouchers for special clientele in need of financial aid, and the creation of

educational opportunities centers in each service area.

It goes on to say that the services provided, therefore, should be much less homogeneous than those provided by the traditional full-time model of higher education. The diversity of background, abilities and motivation of adults is much greater than among the youth served by the traditional full-time day higher education. It is not possible to meet adult needs by simply opening regular day courses in a full-time program to adult part-time students. The whole educational philosophy and mode of operation of traditional full-time day higher education is tailored to the needs of youth just out of high school. Massachusetts adults need and deserve an alternative education system geared to their needs. Further, adults usually prefer to study with other adults in non-traditional classroom settings.

At Bristol Community College the problems stated above don't exist solely on paper. They are real problems with real people. We have average adults who appear to be lost in a maze of seemingly irrelevant education. The attempt here is to actualize an alternative approach to these problems by providing the leadership and mechanisms to "move" the institution.

There also are attendant problems with developing a fair and equitable mechanism for the faculty to implement any of their ideas or develop curricular materials.

Let us outline a real problem that occurred late in the Spring Semester of 1973.

With the peculiar nature of the budgeting system as we find it in

the State of Massachusetts there occasionally is a "windfall" of unexpended monies in various accounts usually occurring around April or May. If funds are not expended, it becomes more difficult to request equal or greater amounts in the budget for the next fiscal year.

This occurred in the two accounts pertinent to this discussion:

1. 03 account - consultants
2. 13 account - educational materials

This being the case, the college administration moved to hire one of the teachers in the college for the summer months to develop video tapes. These video tapes were to be utilized as a regular part of the classroom presentation. When other teachers perceived the situation as being one in which a "favored" teacher was being compensated for developing classroom materials a morale problem developed. Also, other outcomes were undesirable because of the election procedure.

1. The video tapes, however expert, were not utilized because of bad feeling that developed within the department.
2. Other teachers who normally would have developed classroom and curricular materials as part of their job, now indicated that they were reluctant to do so without additional compensation.

Through this practicum we will provide the leadership and the mechanism to cause a decided shift from the teaching of classes to the teaching of students.

CHAPTER 2

SKINNERIAN PRINCIPLES VALID FOR THE DEVELOPMENT
OF COMPUTER ASSISTED INSTRUCTIONAL PROGRAMS

A recent review of the literature indicates the following educational principles to be largely accepted as a basis for the development of Computer Assisted Instructional Programs and attendant behavioral objectives:

1. That the purpose of education is to change students behavior in some way.⁵
2. If a student's behavior is to be changed, he should emit that behavior during the instructional process so that it may be reinforced.⁶
3. Reinforced behaviors are most likely to recur. It is important that the desired behaviors be reinforced by the home, school, youth organization, society as a whole, etc.
4. The greatest effort is advanced by the student when tasks are attempted which fall within the "range of challenge"--not too easy and not too difficult, where success appears likely but not certain.
5. The greatest effort occurs when the students have a meaningful role in the selection and planning of the enterprise.

5. John M. Flynn, Learning Theory and Applications, Nova University, 1973, p. 294.

6. Ibid, p. 295.

6. Motivational factors--grades, praise, attention, material objects, change in environment, determine whether or not stimuli will be reinforced.⁷ Example--There may be an undesirable reaction to excessive direction from the teacher such as defiance or apathetic conformity.
7. What is learned is most likely to be available for use if it is learned in a situation much like that in which it is to be used and immediately preceding the time when it is needed. Learning, forgetting and then relearning when the need arises is not an efficient procedure.
8. The learning method should involve dynamic methods of inquiry. Learning takes place through the active behavior of the student. It is what he does that he learns, not what the teacher does.
9. The essential means of an education is through the experiences provided not the things to which a student is necessarily exposed.
10. Repetition is useful. We learn what we practice. Quizzes force students to do the material.
11. Explicit Directions. The learner should be given exact details of policies and procedures for the course. He should know what he is expected to do and how he is to proceed at every

7. Ibid, p. 295.

step of the way.⁸

12. Students are more likely to become involved in issues if they are aware of how they can have some effect upon the decision making.
13. Knowledge of Results. Feedback to the learner regarding his performance is essential. Knowing that he is performing well permits him to move on with confidence; with information readily available on where and why he is incorrect, he can take the necessary steps to improve his performance.⁹
14. Appropriate Media. Media may include all of the controllable influences that are designed to enhance learning. Broadly defined, media can be persons (e.g., instructors, paraprofessionals, peers), materials (audiotapes, films, charts, books), or activities (reading, laboratory work, projects).¹⁰

Given the above principles of learning as a basis, one can adopt and adapt the procedures developed by S. N. Postlethwait for mini-courses he developed in 1961 using audio-taped presentations to supplement the instruction in his freshman botony course at Purdue University.

The application of these procedures are also valid in the develop-

8. John E. Roueche and Barton R. Herrscher, Toward Instructional Accountability, Westinghouse Learning Press, 1973, p. 18.

9. Ibid, p. 18.

10. Ibid, p. 19.

ment of an approach for CAI. The following represents a slight modification of these procedures.¹¹

1. Objectives are stated in terms of student performance and are usually presented to the student before the instruction begins.
2. Objectives are stated first, test items are designed to measure mastery of these objectives, then instructional materials are selected to assist the student in mastering the objectives.
3. Each student can proceed at his own rate. He is free to skip any portion of the minicourse as long as he can demonstrate mastery of the objectives. He is also free to repeat any portion of the minicourse as often as necessary.
4. Different learning strategies are used for objectives representing different kinds of learning. Several instructional strategies are used to optimize learning on a given topic. Media are selected to complement the type of objective and type of learner, then student-tested.
5. CAI provides for active student participation. The student learns by doing. The student is actively involved in manipulating the instructional materials.
6. The CAI Program is considered a failure if a significant number of students fail to reach the criterion performance. If a student wants to study a particular topic in greater

11. Ibid, p. 25.

depth, he can secure supplementary materials and proceed without interrupting the progress of an entire class.

Remedial help and extra time are also available to help slow learners reach mastery. If a student is having difficulty mastering a lesson, he can spend the additional time and get individual help from the teacher without delaying the entire class.

7. The students spend as much time as necessary to master the topic. Time required for mastery is usually distributed normally and tends to correlate highly with IQ.
8. Instruction can be at the student's convenience and at the time of day when the student learns "best." CAI provides greater freedom for students to adjust study time and subject-matter content to individual needs and peculiarities of interest.
9. Learners are given the objectives and told how attainment of them will be evaluated. Tests are designed to measure mastery of the objectives. The student receives credit when he can demonstrate mastery even if he has not gone through the course. Test items (questions) are used for assessing prerequisite skills, for diagnosing difficulties, and for confirming mastery.
10. Slow learners master some of the objectives but may not have time to master others in an arbitrary period. Given time, even slow learners are able to master most, if not all, of the

objectives.

11. Revisions of materials are based on student performance. If students are not mastering the material, it is revised. Subject matter that is constantly changing can be updated with a minimum of cost and effort.

CHAPTER 3

THE RESEARCH OF VARIOUS
COLLEGES AND UNIVERSITIES USING
COMPUTER ASSISTED INSTRUCTION

The first step in our research of institutions who may be using Computer Assisted Instruction (CAI) was to devise a letter (Appendix B) explaining the purpose of our research. This letter was sent to the following institutions in Southeastern Massachusetts and nationally:

Institutions in Southeastern Massachusetts

Southeastern Massachusetts University
Bridgewater State College
Massasoit Community College
Wheaton College
Cape Cod Community College
Stonehill College

Other Institutions

Rhode Island Junior College
University of Massachusetts
Boston University
Boston College
Northeastern University
Berkshire Community College
Brown University
Bryant College
Providence College
Rhode Island College
Suffolk University
University of Rhode Island
Salve Regina College

Stanford University
University of Illinois
Pennsylvania State University
University of Pennsylvania
University of Michigan
University of Texas
Florida State University
University of California
Dartmouth College
Delta College
Cuyahoga Community College
Coast Community College District

In a survey of this nature, there will obviously be a certain per-

cent of institutions who will not respond. However, in our survey, 66% of the institutions did respond. The following is a discussion of (a) selected institutions outside of Southeastern Massachusetts who are using CAI and are leaders in this field and (b) our visits to institutions in Southeastern Massachusetts who have CAI or are planning to implement some form of CAI in the future.

Selected Institutions Using CAI

Rhode Island Junior College. The Computer Assisted Instruction system at RIJC operates under a multi-programming environment on an IBM 360/40 system. CAI programs also run concurrently with other programs in the college who share the same central computer facilities as required.

The terminals in use at RIJC are the IBM 2741 communication terminals. They are located in the CAI studio and are connected to the computer by means of ordinary telephone lines. Access to the computer is continually being transferred from one terminal to the other on a time sharing basis.

There are nine communication terminals available at RIJC. These terminals resemble electric typewriters and can be operated by anyone; typing is not a requirement in operating these terminals.

The programming language presently used at this institution is IBM's COURSEWRITER III, Version 3. All instructional programs are written in the COURSEWRITER programming language.

Course material for CAI is entered into the system through the

same terminals that are used for presentation of the courses to students. Both the course text and the COURSEWRITER operating program are stored on magnetic units at the computer.

Rhode Island Junior College is located in Southeastern Rhode Island and is approximately 40 minutes from Bristol Community College. We have been in constant communication with them and have asked and received a detailed report of the cost of implementing a CAI system at Bristol Community College on a time sharing system with them. This report will be explained in the next chapter.

The Pennsylvania State University. The system used at this institution is an IBM 1500 instructional system. They presently have three compatible CAI systems in operation. One is located on the main campus and has 32 student stations and two are located in mobile units that travel nationally providing inservice teacher education.

The student stations are equipped with a Cathode Ray Tube (CRT) with a keyboard and light pen used by the student in making responses. All courses make use of branching and individualized teaching techniques and students interact at the terminals with a teaching program which has been prepared by a faculty member at Pennsylvania State. Each station also has an image projector and an audio device for playing and recording messages for the student.

An interesting service that Penn State is providing to all inservice teachers of handicapped children is called CARE (Computer Assisted Renewal Education). This course is offered in a mobile unit which houses an IBM 1500 instructional system with 16 student stations.

This mobile van travels nationally and can serve up to 150 teachers during a six to eight week stop.

To say the least, Penn State is certainly moving ahead in the CAI field and the following quotation sums up how they feel about their program:

"We feel that mobile CAI is a new and innovative concept in inservice teacher education. The impact of the course is maximized by the fact that mobile CAI permits the course to be disseminated to large numbers of teachers who reside in different parts of the United States".¹²

University of Illinois. This institution has been a leader in CAI since 1960 when it implemented a computer based teaching system called PLATO (Programmed Logic for Automated Teaching Operation). Their establishment of a research laboratory led to their present system called PLATO IV.

The PLATO IV time-sharing system is based upon a very simple, logical, and flexible authoring and editing programming language called TUTOR. This language permits a teacher with no previous computer experience to prepare CAI courseware and maintain or improve it.

The hardware configuration for this system represents a considerable investment by the University and can accomodate over 1,000

12. Franklin D. Dimmick, "Computer Assisted Instruction at Penn State" (unpublished report, Pennsylvania Computer Assisted Instruction Laboratory, 1973), p. 10.

PLATO IV terminals. The system uses a CDC (Control Data Corporation) 6500 computer and several hundred PLATO IV student terminals.

This system at the University of Illinois seems to be one of the most effective instructional tools in the country, however, it does have one limitation. The PLATO IV terminal and the TUTOR authoring language can only be used on the PLATO system.

University of Michigan. The University of Michigan, under the direction of Dr. Karl L. Zinn, has had a computer center since its inception in the early 1950's. The present hardware system at the University consists of an IBM 360/67 full duplex machine which has been in operation since 1968. This system provides faculty members and students with access to a machine that is much larger and faster than any of its predecessors.

CAI plays a tremendous role in the educational process at the University of Michigan; they have a vast library of programs available and every department is involved in authorship. Uses of the computer in teaching at the University are too complex to be categorized here at this time.

Dartmouth College. Dartmouth College has had a profound impact on computers in education since 1963. Part of their concept was that all students at the college would use the computer from their first year of college until they graduate. The computer is thought of as an educational facility comparable to a library.

Their present hardware consists of two (2) Honeywell Model 635

computers and ports for 160 terminals. They also have the capacity for mass storage of nearly one million words.

Dartmouth's biggest contribution is their DTSS (Dartmouth Time-Sharing System). The DTSS is a complete operating system for general purpose computing on their computer. Their software is designed to handle up to 250 users assuming a response time lag of less than 10 seconds for moderate size problems. This time sharing operation has been in operation since 1964 and presently has more than 30 secondary schools and 20 colleges in nine states that make regular use of the system.

Delta College. Delta College located at the University Center in Michigan has done considerable research into the uses of CAI and the different systems and options available to colleges. Presently they have an IBM 360/40 computer that is used for a variety of tasks including: Instruction, Student Records Research, Census, Management Information Systems, Faculty uses and Business. This system seems to be highly compatible to our needs at Bristol Community College and will be discussed in the next unit.

Delta College also leases six (6) terminals on the Dartmouth Time Sharing System (DTSS). Two terminals are portable and are for faculty use in the Delta College area while four terminals are fixed and are used by faculty and students on campus.

Coast Community College District. The Coast Community College District consisting of Orange Coast and Golden West Colleges in

California seems to have tremendous CAI capabilities.

They presently have a sophisticated IBM 370/155 with more than 70 terminals. In their early stages of development an IBM 360/40 was used until there was a tremendous demand for additional terminals and the development of online administrative applications.

At the present time, they are using APL (A Programming Language) and have more than 700 course segments in use. APL interactive services are presently offered 19 hours daily, with a high utilization on 70 terminals on both campuses.

Stanford University. Stanford University, under the direction of Dr. Patrick Suppes, has been a leader in the development of CAI for many years. Their system is vast and a variety of computers are used on campus. Without going into a discussion of their huge system, we can say realistically that Stanford University operates a computing system which distributes instructional computing to a number of centers throughout the country. They have a large scale, service type operation at present, depending on long distance telephone communications to connect many remote sites with their central computer. They also have many terminals at remote centers that are usually associated with elementary school demonstration projects and special education institutions.

Visitations of Area Institutions

Several criteria were established as a basis for the selection of educational institutions in Southeastern Massachusetts as visitation

sites.

First, it was determined that the institution of higher learning was actively engaged in instructional computing or will be in the near future. Second, it was also determined that the institution chosen for a visit needed to be doing or will be doing things that were relevant to community colleges, and that could conceivably be used at Bristol Community College.

Three visitation sites were selected, each meeting the above criteria: Massasoit Community College in Brockton, Massachusetts, Southeastern Massachusetts University in Dartmouth, Massachusetts and Wheaton College in Norton, Massachusetts.

Massasoit Community College. Massasoit Community College is one of our 15 sister colleges in the Commonwealth. Their goals and philosophy are very similar to that of Bristol Community College. Mr. Edward LeMay, Director of the Computer Center, informed us that they are not using CAI per se but are using their system for existing programs and it is used in their Computer Science courses.

They presently have two terminals (ASR 33) that are "tied-in" to a Hewlett-Packard 2000 at Babson College in Babson Park, Massachusetts. The language they are presently using is BASIC. Their operation is very small, but given limited resources, it could be easily adaptable by us. Presently there are 11 colleges/universities in Massachusetts using this ACCOMP system with three other Community Colleges also on line.

Since our initial budget request here at Bristol Community College is very low, it seems like this time-sharing system and leasing from Babson College would be very adaptable. Therefore, a detailed discussion of the rental costs of this system and others will be presented in the next unit.

Southeastern Massachusetts University. At the present time, SMU does not have any programs in CAI. However, according to Mr. Peter Kenney, Director of the Computer Center, plans are now being made for academic timesharing. They presently have an IBM 360/40 that is presently used for administrative duties only.

Starting in March, 1974, they plan to add to their system 4 IBM 2471 terminals that will be used for CAI. Their plan is to implement APL into their system rather than the Coursewriter programming language.. They have requested \$220,000 in their budget and plan to have the capability for a Time Sharing System by September, 1974.

Their willingness to cooperate and coordinate CAI functions seems to be fantastic. A detailed budget of leasing time from them is presented and evaluated in the next unit.

Wheaton College. Wheaton College is tied into a private system called NERComp, Inc. of Cambridge, Massachusetts. According to Mr. Phillip Wilson, Director of Wheaton's Computer Center, NERComp is sort of a private brokerage firm that buys a connection into a computer and sells this time in segments. Wheaton College presently has one terminal with a CRT connected to a PDP-10 computer (Digital Equipment

Corporation) at Bowdoin College in Brunswick, Maine for 24 hours daily. They also are connected in Dartmouth College's DTSS for six hours a day. They are presently using BASIC programming language.

Wheaton College is not using their computer time/terminal for CAI drill and course writing. The use of their computer system is to supplement normal courses offered for degree completion. For example, the computer is used heavily in solving mathematical homework and class assignments. A detailed budget to purchase time from NERComp and lease a terminal is presented in the next section.

In visiting the above institutions, our team has gained a tremendous knowledge of who's doing what in the Southeastern Massachusetts area. The cooperation and hospitality that was extended to us in our visits was of the highest caliber.

Our Present Computer System at Bristol Community College. We presently have a small Hewlett Packard computer on campus that is mainly used for Engineering courses; it does not have any CAI capabilities. To upgrade our present computer to implement CAI and have this comparable to that of Babson College, the following is necessary: (1) we would have to add a Hewlett Packard 2100 computer with a 32K word memory; (2) we need a new disc; (3) an Instructional Dialogue Facility and CAI Executive package to facilitate the writing of CAI programs would have to be added, and (4) we would need an additional terminal. The cost for all this would be about \$52,000.00. With our limited budget, this would be highly impossible.

CHAPTER 4

THE SYSTEM-HARDWARE

To rent or to Time Share? Obviously, with a limited budget request of \$9,000.00, the decision was simple - Time Share! This Chapter is divided into two sections: (1) a discussion of the entire system we would recommend for implementation if we had the appropriated monies and (2) a discussion of several leasing proposals for Time Sharing.

The IBM 360-Model 40 System.

The IBM 360/40 system seems to be highly adaptable to our college at the present time. Rhode Island Junior College in Warwick is presently using this system with tremendous results. SMU in Dartmouth, Massachusetts also has a 360/40 and plans to extend its services.

The IBM 360/40 can service both the administrative and the academic area. Instructional uses of the computer can be programmed in any discipline. The programming language that seems to be geared to this system is the IBM Coursewriter III, version 3 which is easily learned by inexperienced teachers. The following table is a schedule of equipment cost for the IBM 360/40 system:

TABLE II

SCHEDULE OF EQUIPMENT COST¹³

Name and Quantity of Components for Total CAI Equipment Con- figuration	Total Cost of Components per Year
IBM 360/40 CPU, 128 K Core	\$72,684.00
4 each IBM 2415 Tape Drives	13,440.00
3 each Memorex #660 Disk Drives	22,440.00
IBM 2821 Control Unit	11,448.00
IBM 2540 Card Reader/Punch	6,768.00
IBM 1403-NI/Printer	9,558.00
Memorex #1270 TCU	13,080.00
IBM #2711 Modems (12 each)	1,998.00
IBM #2740 Terminals (6 each)	7,452.00
TOTAL	\$158,442.00

TABLE III

PERSONNEL SCHEDULE FOR COMPUTER ASSISTED INSTRUCTION¹⁴

JOB TITLE	COST PER MONTH	COST PER YEAR
1. CAI Programmer	\$625.00	\$7,500.00
2. CAI Scheduler	458.33	5,500.00
3. CAI Director	<u>1,000.00</u>	<u>12,000.00</u>
TOTALS	\$2,083.33	\$25,000.00

13. Charles C. D'Arezzo, "An Assessment of Computer-Assisted Instruction For Remediation Programs In Selected Mathematics and English Concepts For Vocational-Technical Students" (unpublished Doctor's Dissertation, Laurence University, 1973) p. 90.

14. Ibid, p. 91.

The following figures show the equipment configuration breakdown and a simple proposed flow chart of the system contemplated.

FIGURE I

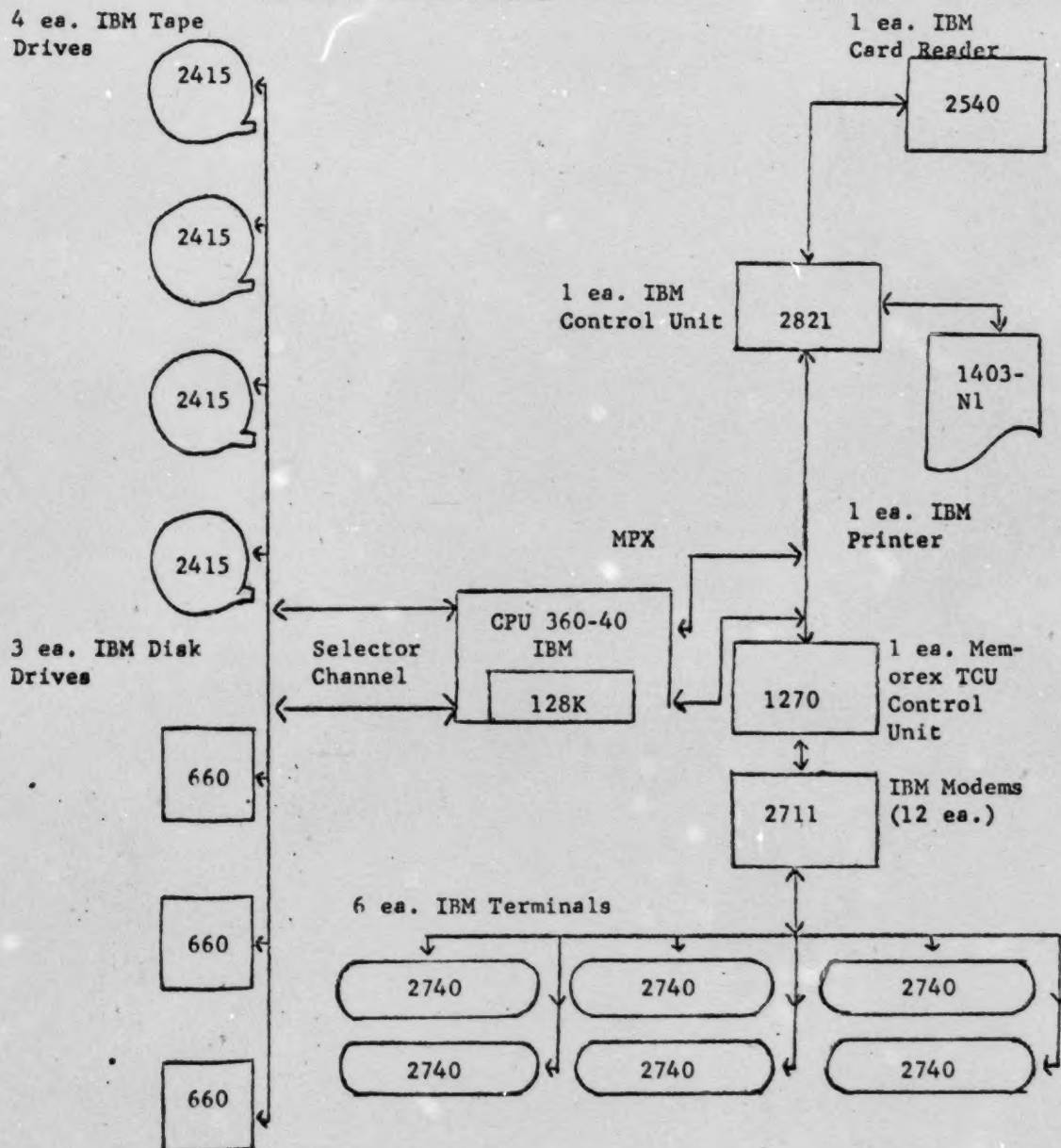
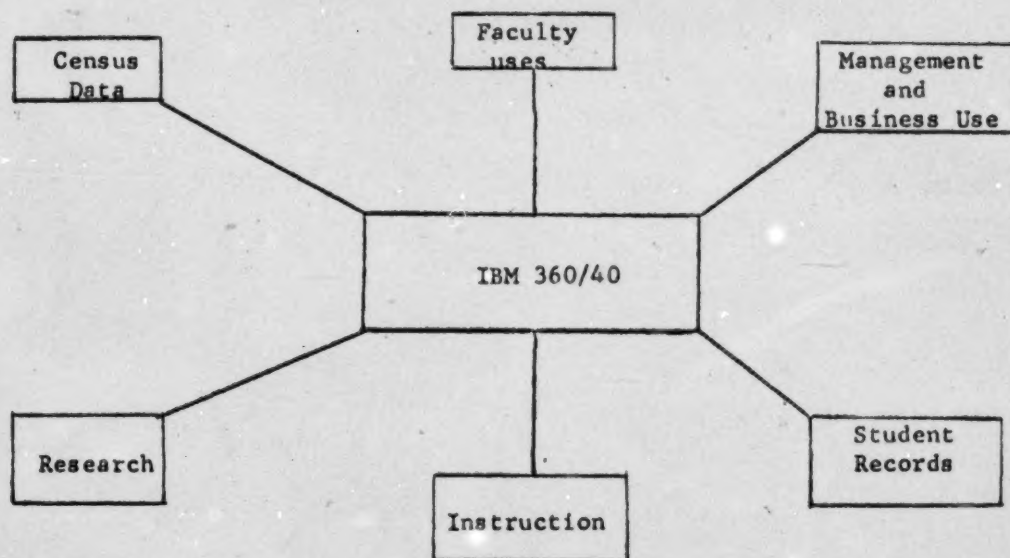
EQUIPMENT CONFIGURATION BREAKDOWN¹⁵

FIGURE 2

PROPOSED IBM 360/40 FLOW CHART

In summary, at the present time it is impossible both financially and personnel wise for Bristol Community College to implement a computer system. Our recommendations obviously are to rent a terminal or two and tie into a time sharing system.

Several Leasing Proposals

The following cost estimates were supplied to us by each institution that we visited including Rhode Island Junior College. They are estimates quoted by the Computer Center Director for implementing two terminals for CAI purposes here at Bristol Community College.

Cost of Implementing CAI to Time Share with RIJC. The following costs were estimated by Dr. Charles D'Arrezzo at RIJC.

A. Utilization

1. 8:00 A.M. - 9:00 P.M. (Monday-Friday)

B. Hardware Cost:

1. 2 IBM 2740 Terminals at \$100 each	\$ 200.00 per mo.
2. CPU Time	300.00 per mo.
3. Input/Output Devices	200.00 per mo.
4. Disk Storage	150.00 per mo.
5. Communication Adapters	<u>160.00</u> per mo.
	\$1,010.00 per mo.

12 months x \$1,010 per mo. = \$12,120 Cost per year for Hardware

C. Telephone Cost (Estimate from furthest distance)

1. 2 exchanges at \$43.17 each	86.34 per mo.
2. 1 time Instillation Cost (\$10 per Instillation)	20.00

12 months x \$86.34 per month = \$1,036.08 Exchange Cost
20.00 Instillation
 \$1,056.08 Total

D. Consultants

Grand Total of Time Sharing for One Year

A. Hardware Cost	\$12,120.00
B. Telephone Cost	1,056.08
C. Consultants Fees	<u>500.00</u>
TOTAL COST	\$13,676.08

Cost of Implementing CAI to Time-Share with Babson College. The following costs were estimated by Mr. Edward LeMay of Massasoit Community College who is presently "tied in" with Babson on the ACComp system:

A. Utilization:

1. 8:00 - 9:00 P.M. (Monday-Friday)

B. Hardware Cost:

1. 2 ASR 33 Terminals from National Data Corporation of Summerville, Massachusetts at \$75 each. \$150.00 per mo.

2. Time-Sharing "tie in" to Hewlett Packard 2000 at Babson College (Includes CPU Time, etc.)
 $\frac{225.00}{\$375.00}$ per mo.

12 months x \$375 per month = \$4,500 Cost per year for Hardware

C. Telephone Costs:

1. 3.50 per mi/each month x 50 miles to Babson College \$175.00 per mo.

2. 1 Time Instillation Charge 90.00

12 months x \$175 per month = \$2,100 Exchange Cost
 $\frac{90}{\$2,190}$ Instillation
 Total

D. Consultants \$500 Total

Grand Total of Time Sharing for One Year:

A. Hardware Cost	\$4,500.00
B. Telephone Cost	2,190.00
C. Consultants Fees	<u>500.00</u>
TOTAL COST	\$7,195.00

Cost of Implementing CAI To Time-Share With SMU. The following is a tentative cost schedule supplied to us by Mr. Peter Kenney at South-eastern Massachusetts University:

A. Utilization:

1. 8:00 A.M. - 9:00 P.M. (Monday-Friday)

B. Hardware Costs:

- | | |
|---------------------------------------|-----------------------|
| 1. 2 IBM 2741 terminals at \$100 each | \$200.00 per mo. |
| 2. CPU Time at SMU | 100.00 per mo. |
| 3. Usage Costs (Storage, etc.) at SMU | <u>600.00</u> per mo. |
| | \$900.00 per mo. |

12 months x \$900 per month - \$10,800 Cost per Year for Hardware

C. Telephone Costs:

- | | |
|--|-----------------|
| 1. \$3.50 per mi/each month x 15 miles | \$52.50 per mo. |
| 2. 1 Time Instillation | 90.00 - |

12 months x \$52.50 per month = \$630.00 Exchange Cost

90.00 Instillation

\$720.00 Total

D. Consultants \$500.00 Total

Grand Total of Time-Sharing for One Year:

A. Hardware Costs	\$10,800.00
B. Telephone Cost	720.00
C. Consultants Fees	<u>500.00</u>
TOTAL COST	\$12,020.00

CHAPTER 5

THE SYSTEM-SOFTWARE

As part of the research into CAI systems, existing software was researched. Below is a summary of software which is available in six CAI systems--Rhode Island Junior College System, University of Illinois System, Babson Time-Sharing System, Southeastern Massachusetts University System, NERCOMP, Inc., Time-Sharing System and the Dartmouth Time-Sharing System.

Rhode Island Junior College (RIJC)

The programming language used to write CAI programs in the Rhode Island Junior College CAI system is COURSEWRITER. This is a high-level programming language that enables teachers (who need not be knowledgeable about computers or computing languages) to organize and present their material through Rhode Island Junior College's CAI system. A teacher does not have to learn a programming language.

RIJC has a comprehensive library of CAI programs, and all educational programs are geared to community college students. Much of the CAI educational material at RIJC is remedial in nature with programs available in English grammar, writing skills, spelling, basic arithmetic drill and practice, and algebra vocabulary. Appendix C gives a complete list of subject areas in which CAI programs are available.

University of Illinois - PLATO IV SYSTEM

The University of Illinois PLATO IV Time Sharing System relies upon a very simple, logical and flexible authoring and editing language called TUTOR. This language is based on English grammar and syntax, and is designed for teachers with no previous knowledge of computers. More than 1,000 lessons in 40 subject areas have been generated for student use; however, the lessons which are written by individual authors are the "property" of the author rather than the System. As a consequence, the bulk of the System software is usable only by permission of the author. Ease of obtaining permission to use lessons seems to be a point of some disagreement. A list of subject areas in which CAI curriculum materials have been developed is included in Appendix C.

Babson Time-Sharing System - ACCOMP

Two programming languages are used by ACCOMP to generate CAI programs--BASIC and COURSEWRITER. Although BASIC is primarily a problem-solving language, it is an interactive language and can be used to write educational programs. A teacher would have to learn BASIC programming language to write CAI programs using BASIC. The COURSEWRITER programming language enables teachers who do not have any knowledge of computing languages to write educational material.

ACCOMP provides a third alternative for developing CAI programs--the Hewlett Packard Instructional Dialogue Facility. This is a

software system which enables instructors to conversationally generate CAI materials and, to concentrate on the instructional content rather than programming requirements.

ACCOMP has an extensive library of CAI programs available. These are programs which have been compiled both by Hewlett Packard and by ACCOMP are available to ACCOMP users. Bristol Community College also has access to Rhode Island Junior College's library of CAI programs which are written in COURSEWRITER. Appendix C respectively lists the subject areas in which CAI programs are available from ACCOMP's library and from Rhode Island Junior College's library.

Southeastern Massachusetts University System

The programming language used by the IBM-360-40 computer at Southeastern Massachusetts University is APL. Although many people in the field of CAI believe this is one of the best languages for authoring computer instruction units, teachers would have to learn APL before they could generate CAI materials. Since Southeastern Massachusetts University is only now considering using their computer for CAI, many questions concerning software remain unanswered. One such problem is that although many CAI programs have been generated in APL, it is unclear if Southeastern Massachusetts University will have access to these programs.

NERComp, Inc.

Since the NERComp, Inc., Time-Sharing System provides users both the use of the computer at Bowdoin College and the Dartmouth Time-Sharing System, a variety of programming languages are available. These are BASIC, COBOL, FORTRAN, ALGOL, APL, and ASSEMBLER. Although an author-oriented CAI language is not available, BASIC and APL would be adequate to generate CAI programs. Before generating CAI materials a teacher would have to learn either BASIC, a fairly easy language to learn, or APL.

Also available to NERComp users would be the software libraries of both the Dartmouth Time-Sharing System and Bowdoin College. Appendix C lists the subject areas available from the DDTS library and Bowdoin College's library.

Dartmouth College - The Dartmouth Time-Sharing System (DTSS)

The edge that DTSS has over other time-sharing networks appears to be ten years of expertise in building a software system. BASIC, COBOL, FORTRAN, ALGOL, APL, and ASSEMBLER are the interactive programming languages used by the System. Since one of these are author-oriented CAI languages, a teacher would either have to learn one of these languages or enlist the help of a programmer in order to generate CAI materials. Both BASIC and APL are languages which lend themselves to CAI.

The staff of DTSS has written a large library of programs, many of which are community college oriented. Also available to

users is a large library of problem-solving programs. A listing of the subject areas in which programs are available is included in Appendix C.

CHAPTER 6

SAMPLE CAI PROGRAMS

To illustrate four of the modes in which a computer can be made to interact with the student, four types of CAI programs were obtained: (1) Drill and practice; (2) Tutorial; (3) Simulation; (4) Problem-solving.

1. Drill and practice is the use of a computer to present learning material, such as spelling drills and problems in arithmetic which utilize the same sequence and format to give a student repeated opportunities for response. The student uses his natural language, and the objective is to build skills.

2. In the tutorial mode of interaction, the computer simulates much of the behavior of the skilled teacher and may add some qualities even the skilled teacher may not possess, e.g., virtually unlimited memory for past performance by the individual student and his peers, a store of instructional alternatives which may be the product of a team of instructional strategists, etc. It should be noted that the line between the drill and practice mode and a tutorial strategy is somewhat ill defined.

3. In the simulation mode, the CAI program causes the computer to generate data characteristic of a physical process or mathematical function which might otherwise be inaccessible to the student. The student is given options to use in deciding what and how to

vary the input, and the system quickly reports the consequences of his decisions. In simulation, the input and output correspond highly to a real situation.

4. Problem-solving refers to the use of a computer to solve quantitative problems and the student uses a programming language, like FORTRAN or BASIC to accomplish his purpose.

The subject areas in which the sample programs were obtained are Mathematics, Accounting, and Biology. Since these sample CAI programs have been used in community colleges which have students with learning characteristics similar to the characteristics of Bristol Community College students, it is highly probable that these programs will be applicable to students at Bristol Community College.

Drill and Practice

The following two sample programs illustrate the drill and practice mode.

1. ACCTRAL, obtained from the Coast Community College District, Orange County, California, is a CAI program in accounting. The ACCTBAL lesson on the next page provides the student with the necessary drill to learn the introductory accounting concepts concerning account balances.

The ACCTBAL lesson that follows is shown as the student sees it. The portion that the student types is underlined to differentiate between the computer's statements and those of the student. Note the comments that are made to the student when he answers a question.

Such comments are important.

ACCTBAL

HI PAL, HOW ABOUT TYPING YOUR FIRST NAME.

DICK

WELL DICK WE ARE GOING TO LEARN ABOUT ACCOUNT BALANCES AND HOW TO ALTER THEM.

HEY, WHAT IS YOUR LAST NAME?

HOWE

TELL ME IS IT MR. MISS OR MRS.? TYPE THE CORRECT RESPONSE

MR.

OK MR. HOWE, FOLLOW THESE INSTRUCTIONS VERY CAREFULLY, TYPE A FOR ASSET, L FOR LIABILITY, C FOR CAPITAL, R FOR REVENUE, E FOR EXPENSE, CR FOR CREDIT AND DR FOR DEBIT.

ENTER THE NUMBER OF THE SITUATION YOU WOULD LIKE TO TRY.

IF YOU DON'T KNOW, BEGIN WITH THE NUMBER 1 THEN 2, ETC.
THE HIGHEST NUMBER IS 16.

Q:

1

WHAT TYPE OF ACCOUNT IS CASH?

Q

A

YOU DID A GOOD JOB DICK.

NOW TELL ME, HOW DO YOU INCREASE THE CASH ACCOUNT?

Q

DR

YOU'RE A SWEETHEART, MR. HOWE ANOTHER CORRECT ANSWER.

HOW DO YOU DECREASE OR REDUCE THE CASH ACCOUNT?

Q

CR

GOLLY GEE DICK YOU'VE GOT ANOTHER QUESTION RIGHT. WHAT DO YOU SUPPOSE IS THE NORMAL BALANCE FOR THE CASH ACCOUNT?

Q

DR

YOU ANSWERED ANOTHER QUESTION CORRECTLY MR. DICK

HOWE, KEEP IT UP.

ENTER THE NUMBER OF THE SITUATION YOU WOULD LIKE TO TRY.

IF YOU DON'T KNOW, BEGIN WITH THE NUMBER 1 THEN 2, ETC.

Q:

The following shows what happens when the student gives the wrong answer. Note that the hints are intended to allow the student to answer the original question correctly the second time.

ACCTBAL

HI PAL, HOW ABOUT TYPING YOUR FIRST NAME.

DICK

WELL DICK WE ARE GOING TO LEARN ABOUT ACCOUNT BALANCES AND HOW TO ALTER THEM. HEY, WHAT IS YOUR LAST NAME?

HOWE

TELL ME IS IT MR. MISS OR MRS.? TYPE THE CORRECT RESPONSE.

MR.

OK MR. HOWE, FOLLOW THESE INSTRUCTIONS VERY CAREFULLY.

TYPE A FOR ASSET, L FOR LIABILITY, C FOR CAPITAL, R FOR REVENUE, E FOR EXPENSE, CR FOR CREDIT AND DR FOR DEBIT.

ENTER THE NUMBER OF THE SITUATION YOU WOULD LIKE TO TRY.

IF YOU DON'T KNOW, BEGIN WITH THE NUMBER 1 THEN 2, ETC.

THE HIGHEST NUMBER IS 16.

☐:

1

WHAT TYPE OF ACCOUNT IS CASH?

☐

L

THAT IS NOT RIGHT. YOU MUST ASK YOURSELF IF CASH IS:

1. SOMETHING YOU HAVE.
2. SOMETHING YOU OWE.
3. SOMETHING YOU OWN.
4. SOMETHING YOU EARNED.
5. SOMETHING YOU SPEND MONEY FOR TO MEET EXPENSES.

WELL WHAT IS IT, TYPE THE NUMBER HOWE.

☐

2

CASH IS SOMETHING YOU HAVE, THEREFORE IT IS AN ASSET.

NOW TELL ME, HOW DO YOU INCREASE THE CASH ACCOUNT?

☐

CR

YOU GOOFED. REMEMBER DICK THE CASH ACCOUNT IS AN ASSET.

WHAT TYPE OF ENTRY INCREASES THE ACCOUNT?

☐

DR

YOUR A SWEETHEART, MR. HOWE ANOTHER CORRECT ANSWER.

HOW DO YOU DECREASE OR REDUCE THE CASH ACCOUNT?

☐

DR

AW COMEON MR. HOWE DO YOU REMEMBER

THE ENTRY TO INCREASE THE CASH ACCOUNT? NOW TELL ME THE

ENTRY TO DECREASE OR REDUCE THE CASH ACCOUNT.

☐

CR

GOLLY GEE DICK YOU'VE GOT ANOTHER QUESTION RIGHT. WHAT DO YOU SUPPOSE IS THE NORMAL BALANCE FOR THE CASH ACCOUNT?

2. SCHOOL, obtained from the ACCOMP library (Babson Time-Sharing System), is an Arithmetic CAI program which reinforces the student's knowledge by allowing each student to practice what he has learned. Page 42 contains a portion of this program.

WELCOME TO THE MATH PRACTICE SESSION

DO YOU WANT INSTRUCTIONS? YES

WAIT UNTIL THE COMPUTER TYPES THE '= ?' BEFORE YOU TYPE YOUR ANSWER.

FOLLOW YOUR ANSWERS WITH A (RETURN).

IF YOU WANT TO CHANGE THE SIZE OF THE NUMBERS IN THE PROBLEMS,
ANSWER THE PROBLEM WITH (888).

IF YOU WANT A DIFFERENT NUMBER OF PROBLEMS, ANSWER WITH (777).

WHEN YOU ARE FINISHED, ANSWER THE PROBLEM WITH (999)
AND THE COMPUTER WILL CALCULATE YOUR SCORE.

PICK A NUMBER BETWEEN 1 AND 1075

LET'S TRY A SIMPLE ONE.

$$2 + 2 = ?4$$

HERE WE GO!

LET'S START WITH ADDITION

$$17 + 18 = ?35$$

$$5 + 10 = ?15$$

$$2 + 8 = ?10$$

$$3 + 18 = ?20$$

WRONG, TRY AGAIN.

$$3 + 18 = ?20$$

THAT'S CLOSE, TRY AGAIN.

$$3 + 18 = ?20$$

THAT'S WRONG TOO. THE CORRECT ANSWER IS 21

LET'S TRY AGAIN

$$3 + 18 = ?21$$

RIGHT! TRY ANOTHER.

$$6 + 1 = ?7$$

$$7 + 9 = ?16$$

$$10 + 0 = 710$$

$$23 + 37 = 760$$

$$36 + 0 = 736$$

$$46 + 14 = 760$$

NOW TRY SUBTRACTION

$$7 - 3 = 74$$

$$10 - 5 = 75$$

$$5 - 4 = 71$$

$$6 - 1 = 75$$

$$22 - 17 = 75$$

$$0 - 0 = 70$$

$$15 - 4 = 711$$

$$22 - 20 = 72$$

$$33 - 0 = 71$$

WRONG, TRY AGAIN.

$$33 - 0 = 72$$

MUCH TOO SMALL, TRY AGAIN.

$$33 - 0 = 755$$

THAT'S WRONG TOO. THE CORRECT ANSWER IS 33

LET'S TRY AGAIN

$$33 - 0 = 733$$

RIGHT! TRY ANOTHER.

$$16 - 5 = 711$$

STOP

BYD

???

BYE

012 MINUTES OF TERMINAL TIME

Tutorial

The following sample program, obtained from the Coast Community College District, is a segment of a series of tutorial programs designed to instruct a student on the use of a slide rule. These programs provide the student with practice questions and are written to provide help if a student commits one of several common errors. Note that the drill and practice mode is also included in this program.

MATHEMATICS

This segment is used in support of the sound-on-slide class in slide rule. The segment randomly generates problems

requiring the use of the square and slide rule. If the student makes an error, the segment provides instruction on how to solve the problem and restate the question.

EXERCISES

HELLO THERE, WHAT IS YOUR NAME ?

DON

THANK YOU, DON, THIS IS AN EXERCISE IN MULTIPLICATION AND DIVISION OF SQUARE ROOTS, CUBE ROOTS, AND SQUARES. IF YOU WOULD LIKE TO STOP BEFORE THE EXERCISE HAS BEEN FINISHED TYPE STOP .

IS YOUR SLIDE RULE A 5, 10, OR 20 INCH RULE ?

□: 7.5

DON SLIDE RULERS OF STANDARD SIZE HAVE D SCALES THAT ARE 5 10 OR 20 INCHES LONG. YOUR RULE MAY NOT FIT EXACTLY ONE OF THESE, BUT USE THE SIZE NEAREST YOUR RULE. YOUR ANSWER MUST BE ONE OF THE FOLLOWING NUMBERS: 5, 10, 20 .

□: 5

DIVIDE THE SQUARE OF 53.3 BY 22 .

□: 138.5

WHAT IS THE SQUARE OF 53.3 ?

□: 2850

DIVIDE THE SQUARE OF 53.3 BY 22 .

□: 124

GOOD WORK, KEEP IT UP.

DIVIDE THE SQUARE OF 5200 BY 840 .

□: .086

WHAT IS THE SQUARE OF 5200 ?

□: 72

MOVE THE CURSOR SO THAT 5200 ON THE D SCALE IS UNDER THE HAIRLINE.

READ THE SQUARE OF 5200 UNDER THE HAIRLINE ON THE A SCALE.

THE SQUARE OF 5200 IS ?

□: 26000000

DIVIDE THE SQUARE OF 5200 BY 840.

□: 32300

GOOD WORK, KEEP IT UP.

MULTIPLY THE CUBE ROOT OF 3840 BY 0.7 .

□: STOP

IN THIS EXERCISE DON YOU HAD THE CORRECT ANSWER TO 2 PROBLEMS.

AND WERE INCORRECT ON 2 OF THE PROBLEMS. COME BACK AGAIN.

IT HAS BEEN MY PLEASURE TO WORK WITH YOU DON GOOD BY.

MATHEMATICS

Slide Rule

This segment is used in support of the sound-on-slide class in slide rule. The segment randomly generates problems

requiring the use of the square and cube found on a slide rule. If the student makes an error, the segment provides instruction on how to solve the problem and restate the question.

EXERCISES

HELLO THERE, WHAT IS YOUR NAME ?

DON

THANK YOU, DON, THIS IS AN EXERCISE IN MULTIPLICATION AND DIVISION OF SQUARE ROOTS, CUBE ROOTS, AND SQUARES. IF YOU WOULD LIKE TO STOP BEFORE THE EXERCISE HAS BEEN FINISHED TYPE STOP .

IS YOUR SLIDE RULE A 5, 10 OR 20 INCH RULE ?

□: 7.5

DON SLIDE RULERS OF STANDARD SIZE HAVE D SCALES THAT ARE 5 10 OR 20 INCHES LONG. YOUR RULE MAY NOT FIT EXACTLY ONE OF THESE, BUT USE THE SIZE NEAREST YOUR RULE. YOUR ANSWER MUST BE ONE OF THE FOLLOWING NUMBERS: 5, 10, 20 .

□: 5

DIVIDE THE SQUARE OF 53.3 BY 22.

□: 138.5

WHAT IS THE SQUARE OF 53.3 ?

□: 2850

DIVIDE THE SQUARE OF 53.3 BY 22 .

□: 124

GOOD WORK, KEEP IT UP.

DIVIDE THE SQUARE OF 5200 BY 840 .

□: .086

WHAT IS THE SQUARE OF 5200 ?

□: 72

MOVE THE CURSOR SO THAT 5200 ON THE D SCALE IS UNDER THE HAIRLINE.

READ THE SQUARE OF 5200 UNDER THE HAIRLINE ON THE A SCALE.

THE SQUARE OF 5200 IS ?

□: 26000000

DIVIDE THE SQUARE OF 5200 BY 840 .

□: 32300

GOOD WORK, KEEP IT UP.

MULTIPLY THE CUBE ROOT OF 3840 BY 0.7 .

□: STOP

IN THIS EXERCISE DON YOU HAD THE CORRECT ANSWER TO 2 PROBLEMS,

AND WERE INCORRECT ON 2 OF THE PROBLEMS. COME BACK AGAIN.

IT HAS BEEN MY PLEASURE TO WORK WITH YOU DON GOOD BY.

Simulation

The following sample program (GENE), obtained from the ACCOMP library, is a simple genetics program which simulates dominant and recessive traits.

NAME: GENE

DESCRIPTION: Simple genetics program to simulate
dominant and recessive traits.

INSTRUCTIONS: Answer questions.

EXAMPLE:

GENE

WHAT ARE THE TWO TRAITS TO BE STUDIED?
DOMINANT TRAIT?BLACK
RECESSIVE TRAIT?WHITE

GENOTYPE OF FEMALE PARENT?"WHITE","WHITE"

GENOTYPE OF MALE PARENT?"BLACK","WHITE"

HOW MANY OFFSPRING DO YOU WANT TO STUDY?12

DETAILED REPORT (YES OR NO)?YES

OFFSPRING NO.	-----GENOTYPE-----		PHENOTYPE
	GENE 1	GENE 2	
1	WHITE	BLACK	BLACK
2	WHITE	BLACK	BLACK
3	WHITE	BLACK	BLACK
4	WHITE	BLACK	BLACK
5	WHITE	BLACK	BLACK
6	WHITE	WHITE	WHITE
7	WHITE	BLACK	BLACK
8	WHITE	WHITE	WHITE
9	WHITE	BLACK	BLACK
10	WHITE	WHITE	WHITE
11	WHITE	BLACK	BLACK
12	WHITE	WHITE	WHITE

GENOTYPE RATIO 0 : 2 : 1
PHENOTYPE RATIO 2 : 1

#####

WANT ANOTHER RUN (YES OR NO)?NO

DONE

Problem-Solving

The following ACCOMP Statistics program (MANDSD) which calculates the mean, variance and standard deviation for each of several sets of individual values or frequency distributions is an example of the problem-solving mode.

MANDSD MEAN, VARIANCE, AND STANDARD DEVIATION

***DESCRIPTION: This program calculates the mean, variance, and standard deviation for each of several sets of individual values or frequency distributions

***INSTRUCTIONS: Enter data for each set of values as follows:

1 DATA N, X(1), X(2), X(3), ... X(N)

where the N values of the set are X(1) through X(N)

1 DATA O, N, X(1), F(1), X(2), F(2), ...X(N), F(N)

where the initial zero signals grouped data, the N is the number of different values to be given, and the F(I) are the number of times the X(I) occur.

SAMPLE: Assume that each data point has a frequency associated with it. See the following for the frequencies used.

Prepare the following data tape:

1 DATA 0,22,261.4,3,270.8,4,265.4,2,261.4,7,258.1,3
2 DATA 252.1,5,268.3,7,250.3,1,272.3,9,262.8,2,255.5,8
3 DATA 249.6,5,280.9,9,270.3,3,262.2,8,258.3,2,256.3,3
4 DATA 259.3,5,270.1,3,259.3,2,253.2,5,266.4,6

MANDSD

ARITHMETIC MEAN, VARIANCE, AND STANDARD DEVIATION

FOR GROUPED DATA SET 1

X-VALUE	FREQUENCY
261.4	3
270.8	4
265.4	2
261.4	7
258.1	3
252.1	5
268.3	7
250.3	1
272.3	9
262.8	2
255.5	8
249.6	5
280.9	9
270.3	3
263.2	8
258.3	2

NUMBER OF VALUES = 102
ARITHMETIC MEAN = 263.524
STANDARD DEVIATION = 8.57248
SAMPLE VARIANCE = 72.767
EST TRUE VARIANCE = 73.4875
ST ERROR MEAN = .848802

CHAPTER 7

RECOMMENDATIONS AND IMPLEMENTATION

The following are our recommendations at this time:

Summer 1974

The College should assign a qualified person to ensure implementation of CAI and its continuance for a minimum of two years.

The College should release at least one teacher part time from his teaching duties to develop CAI materials.

The College should lease at least two ports from the Babson Time-Sharing System--one to be located at Durfee Street and the other to be located in the computer room of the Math and Engineering Building.

Academic Year 1974-75

We should develop and implement in-service training programs to encourage faculty involvement in using CAI.

The Dean of Academic Affairs should implement incentives to encourage faculty involvement in CAI.

The College should develop tools to evaluate project.

Fall 1975

We should continue the leasing of ports from Babson Time-Sharing System.

Academic Year 1975-76

The College should conduct an evaluation of project.

From the results of the evaluation, determine future CAI development.

Reasons for this rationale from a software point of view:

1. ACCOMP has an author-oriented CAI programming language (COURSE-WRITER) which would encourage faculty participation in CAI.
2. ACCOMP has a simple yet powerful problem-solving programming language, BASIC.
3. The sharing of materials, programs, and ideas with other authors and users will be of considerable value; therefore, tying in with a network such as ACCOMP which has users with similar problems and goals will afford BCC opportunities for this sharing.

Reasons for this rationale from a hardware point of view:

Rhode Island Junior College's proposal would certainly give us great service but would be impossible because of lack of funds. SMU's proposal would seem to be a reasonable amount, however, since CAI is proposed and not implemented at that institution, our recommendations are to wait a year or two before becoming a time-sharer.

Our recommendation at this time would be to lease time from Babson College on an arrangement similar to our sister institution, Massasoit Community College. This seems to be feasible for several reasons:

1. The estimated cost is within our proposed budget.
2. Bristol Community College and Massasoit Community College could share resource personnel in developing CAI programs.

3. Since Massasoit Community College is only 30 miles from Bristol Community College a consortium approach to programs, services and problems could be implemented.

The old saying "To take one step at a time" certainly is applicable to our institution. Since we are novices in the CAI field, two leased terminals could be sufficient, however, as we grow and the need warrants more terminals, plans should be made for at least 6 terminals on campus.

Implementation

The implementation of the system is planned to occur in three stages:

1. Budgetary procedures to make provision for the purchase and/or lease of CAI hardware.
2. The location of terminals.
3. A mechanism for the development of educational materials by faculty members.

The 1975 fiscal year budget request has been submitted to the Massachusetts Board of Regional Community Colleges by Bristol Community.

The following has been requested:

1. \$9,000 in the 16 account for educational hardware
2. \$4,000 in the 03 for curriculum consultants for the development of CAI programs. (See appendix D copy of budget request)

Several concerns were considered in determining the locations of the terminals.

1. The area should be easily accessible to faculty and students

alike.

2. The area should be a quiet one where neither the operator nor classes would be interfered with.
3. The area should be one where supervision of students and equipment would be reasonable. This would be beneficial to the student in getting help with problems and hopefully at the same time prevent damage to the equipment. (The building maps in Appendix D indicate the proposed location of the terminals.)

As indicated above attendant problems had developed in the development of instructional materials by faculty members. This problem was noted in a memo dated June 20, 1973 and sent to Dr. Betty Ann Metz who was then in charge of the college. (A copy is enclosed in Appendix D)

A policy and procedure for the development of Instructional materials has now been included in the faculty handbook and has been announced at a general faculty meeting by Richard St. Pierre, Acting Dean of Academic Affairs.

The policy and procedure reads: In order to encourage the use of equipment and services of the Learning Resources Center, the College Administration is making efforts to provide monies and/or released time for the development of educational materials such as audio and video tapes.

Interested Faculty members are urged to develop and submit written proposals to the Assistant to the Dean for Curriculum and Instruction

through their Divisional Chairmen for consideration. The Divisional Chairmen will then discuss the proposals and make recommendations as to which should be supported based upon the merit of the proposal and benefit to the College.

Deadline dates for submission of proposals are:

Fall Semester	April 30
Summer	April 30
Spring Semester	October 15

This has been one of the outcomes of this practicum. There has also been some other very interesting spinoffs since the announcement of this policy to the faculty.

Several requests have now been developed by several areas of the College for released time and monies available for the development of instructional materials. Some of these request include:

Educational opportunities center - a request for the development of materials in Mathematics and English.

Math Department - a request for the development of Video tapes for mini-courses.

Nursing Division - a request for the development of Video tapes for the Nursing Clinic.

Art Department - a request for released time for the expansion and development of the creative arts workshop.

(See appendix D for copies of the requests)

This indicates a positive attitude developing as one of the positive results of involvement in this practicum.

Other very interesting questions are now being raised and discussed

by various groups in the college. In order to provide flexibility of programming and instruction. Some of these questions are:

1. Should certain circumstances warrant a no-semester approach?
2. If so, how do we identify these circumstances?
3. Should there necessarily be class periods for innovative programs?
4. Is there any set length of time within which a given course is to be completed?

Although these questions are not new, they will hopefully serve as a catalyst to develop new and innovative approaches to solving some of the problems noted in this practicum.

INDIVIDUAL SUMMARY SHEET

ARMAND DESMARAIS

As an adult educator and administrator, I am constantly seeking new and innovative methods to help adults learn. My research has proven to me that Computer Assisted Instruction is a viable alternative method of learning for students here at Bristol Community College. Since Continuing Education is usually the innovative and experimental arm of the College, I plan to push for immediate instillation of two terminals for immediate use for students in the Division of Continuing Education.

This practicum has certainly increased my knowledge of the computer as an instructional tool. Certainly I have a better understanding of the area colleges involved in CAI, the hardware configuration of computers and the estimated costs of implementing a CAI system.

My contributions to our joint practicum were:

- a. Researched area colleges who are involved in CAI.
- b. Researched colleges/universities nationally who are leaders in the field of CAI.
- c. Researched the costs of implementing a CAI system here at Bristol Community College; researched the costs of leasing computer time at various locations.

- d. Visited three area colleges involved in some form of CAI.
- e. Shared in the responsibility for recommendations and faculty implementation.

INDIVIDUAL SUMMARY SHEET

RICHARD ST. PIERRE

My involvement in this practicum as Acting Dean of Academic Affairs has had a positive effect in the college through the development of procedures for faculty involvement in curriculum development. Also, a procedure has been developed for the involvement of faculty members in the development of Audio-Visual materials.

As Acting Dean it has also enabled me to exercise a leadership function in the area of innovative teaching techniques.

Personally, it has encouraged me to research and articulate some of the ideas and thoughts that I have had over a period of time. This has occurred because of my commitment to the program and because of the peer pressure exerted in my involvement in a joint practicum.

My contributions to our joint practicum were:

- a. Investigating and researching the problem as it exists at Bristol Community College.
- b. Researched Skinnerian principles as they applied to Computer Assisted Instruction.
- c. Shared in the responsibility for developing a mechanism for faculty implementation.

INDIVIDUAL SUMMARY SHEET

E. FOSTER WIGGINS

Since this practicum was an investigation into CAI and not the application of CAI at Bristol Community College, the effect that the practicum had upon my work at BCC has been mainly in terms of my future plans. First, I hope to be involved in the implementation of CAI at Bristol Community College. Second, as soon as BCC has the capabilities for CAI, I plan to use CAI as an alternative method of teaching, both in my mathematics classes days and in my GED classes evenings. I plan to use CAI in both the drill and practice mode and the tutorial mode. Over all, my visits to other institutions to learn about CAI systems has caused me to become very enthusiastic over CAI as an alternative method of instruction.

My contributions to our joint practicum were:

- a. Researched the existing CAI systems of various colleges/ universities in Southeastern Massachusetts and Rhode Island; This included both hardware and software. In conjunction with this, I visited four area colleges.
- b. Researched and obtained sample programs in Mathematics, Biology and Accounting.
- c. Determined the proposed locations of the terminals at Bristol Community College.
- d. Shared the responsibility for developing a mechanism for faculty implementation.

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CLEARINGHOUSE FOR
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